

A check-list of the macro moths of Rowardennan, East Loch Lomondside, Stirlingshire

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ABSTRACT

A Rothamsted light trap has been operated continuously at the Scottish Centre for Ecology and the Natural Sciences at Rowardennan on east Loch Lomondside since 1968. Over 344,000 records of moths captured in this trap between 1968 and 2005 have been analysed and compiled into a checklist.

INTRODUCTION

More than 2500 species of moth occur in the UK. For reasons of convenience rather than scientific rationale these are divided into the larger (or macro) moth species of which there are approximately 900 species and the smaller (or micro) species comprising approximately 1600 species. As key components of the terrestrial environment, moths are excellent indicators of the health of an eco-system. Many have highly specific habitat requirements that reflect in large measure the often highly specific food plant needs of the larval stage. The diversity of moths in a habitat thus reflects the diversity and health of its vegetation. This paper presents a compilation of 37 years of daily sampling of the macro-moth diversity of the oak woods and surroundings at Rowardennan on east Loch Lomondside, Stirlingshire.

This information on the local moth assemblage is intended to inform the many organizations with an interest in the conservation of wildlife within the Loch Lomond and Trossachs National Park. In addition, it is hoped that it will serve as a data resource for those interested in the study of the Lepidoptera of the area.

The Rothamsted Insect Survey (RIS) has operated a network of specially designed moth traps throughout the UK since 1968 and has used the data obtained from them to monitor long-term population trends in the most common and widespread British moths (Conrad *et al.*, 2004). The traps are of low efficiency compared with other trap designs. As such they tend to capture small but consistent and manageable numbers of moths without threatening or affecting the populations being studied. They are operated by volunteers who run the traps every night and send captured moths to the RIS where identities are verified and the data stored in a standardized manner.

The data, represents a compilation of over 344,000 individuals of 320 different macro moth species captured in a single Rothamsted trap run at Glasgow Universities Scottish Centre for Ecology and the Natural Environment (SCENE, formerly known as the Glasgow University Field Station) at Rowardennan on east Loch Lomondside between 1968 and 2005.

METHODS AND RESULTS

Moths were captured in a standardized Rothamsted trap located at NS378960 in an extensive belt of semi-natural oak woods, comprising mostly *Quercus petraea* x *robur* hybrids, which covers much of the lower slopes of both the eastern and western shores of Loch Lomond. Consequently, species characteristic of an oak wood would be expected to dominate the catch. However, smaller numbers of moths might be expected from the alder (*Alnus glutinosa*) and willow (*Salix sp.*) that fringe the loch shore, from the area of the nearby Dubh Lochan, from patches of planted alien conifers and from the upper loch-side slopes characterised by more open habitats and birch wood.

The data comprises a compilation of the total daily catches for the years 1968 to 2005 with the exception of periods of equipment failure during 1973, 1974, 1993 and 1994. Some of this data has already been used to analyse the increasing abundance and diversity of the moth assemblage of east Loch Lomondside (Salama *et al.*, 2005, 2007). For the purposes of the present analysis, the total data set supplied by RIS were reformatted into Mapmate (Teknica Limited 2005), a software package designed for the storage, analysis and mapping of fauna and flora data-sets.

Table 1 presents a compilation of 344,361 capture records presented in the order of their British checklist number (Bradley, 2000).

Table 1. A checklist of the macro-moths of Rowardennan, East Loch Lomondside, Stirlingshire.

British checklist number	Species	Vernacular name	Total number caught	First and last year recorded	Earliest and latest dates recorded	UK Status
0014	<i>Hepialus humuli</i>	Ghost Moth	22	1972-1991	20 Jun-06 Aug	Common
0015	<i>Hepialus sylvina</i>	Orange Swift	29	1975-2003	10 Jul-17 Jul	Common
0016	<i>Hepialus hecta</i>	Gold Swift	199	1968-2005	25 May- 16 Aug	Local
0017	<i>Hepialus lupulinus</i>	Common Swift	41	1968-2005	01 Jun-08 Aug	Common
0018	<i>Hepialus fusconebulosa</i>	Map-winged Swift	187	1968-2005	27 May- 27 Jul	Local
1631	<i>Poecilocampa populi</i>	December Moth	5170	1968-2005	26 Sep- 29 Dec	Common
1632	<i>Trichiura crataegi</i>	Pale Eggar	1	1970	30 Aug	Common
1637	<i>Lasiocampa quercus</i>	Oak Eggar	22	1977-1997	09 Jun-10 Jul	Common
1638	<i>Macrothylacia rubi</i>	Fox Moth	17	1969-2005	11 May – 19 Jun	Common
1640	<i>Eutlrix potatoria</i>	Drinker	199	1968-2005	31 May- 10 Aug	Common
1645	<i>Falcaria lacertinaria</i>	Scalloped Hook-tip	82	1968-2005	01 May- 14 Aug	Common
1648	<i>Drepana falcata</i>	Pebble Hook-tip	59	1968-2005	22 May-19 Aug	Common
1652	<i>Thyatira batis</i>	Peach Blossom	73	1968-2005	19 May- 24 Sep	Common
1657	<i>Ochropacha duplaris</i>	Common Lutestring	396	1968-2005	18 May- 19 Aug	Common
1659	<i>Achlya flavicornis</i>	Yellow Horned	654	1968-2005	08 Feb – 21 Apr	Common
1663	<i>Alsophila aescularia</i>	March Moth	2222	1968-2005	05 Jan – 26 Apr	Common
1666	<i>Geometra papilionaria</i>	Large Emerald	755	1968-2005	24 Jun – 01 Sep	Common
1669	<i>Hemithea aestivaria</i>	Common Emerald	1	1985	18 Jun	Common
1674	<i>Jodis lactearia</i>	Little Emerald	1634	1968-2005	06 May- 21 Jul	Common
1677	<i>Cyclophora albipunctata</i>	Birch Mocha	1	2005	27 May	Local
1693	<i>Scopula floslactata</i>	Cream Wave	5480	1968-2005	21 Feb – 20 Jul	Local
1694	<i>Scopula ternata</i>	Smoky Wave	355	1968-2005	24 May-01 Aug	Local
1702	<i>Idaea biselata</i>	Small Fan-footed Wave	8907	1968-2005	29 Jun – 26 Sep	Common
1713	<i>Idaea aversata</i>	Riband Wave	2227	1968-2005	12 Jun – 23 Sep	Common
1715	<i>Idaea straminata</i>	Plain Wave	2	1971-2001	22 Jun – 21 Jul	Local
1719	<i>Orthonama vittata</i>	Oblique Carpet	6	1972-2003	28 May-15 Aug	Local
1720	<i>Orthonama obstipata</i>	Gem	1	2001	27 Oct – 27 Aug	Migrant
1722	<i>Xanthorhoe designata</i>	Flame Carpet	357	1968-2005	03 May- 29 Sep	Common
1723	<i>Xanthorhoe decoloraria</i>	Red Carpet	23	1968-2005	18 May-11 Nov	Common
1724	<i>Xanthorhoe spadicearia</i>	Red Twin-spot Carpet	360	1968-2005	03 May-03 Sep	Common
1725	<i>Xanthorhoe ferrugata</i>	Dark-barred Twin-spot Carpet	98	1968-2005	29 Apr-29 Aug	Common
1727	<i>Xanthorhoe montanata</i>	Silver-ground Carpet	5393	1968-2005	12 May – 29 Jul	Common
1732	<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	3	1969-1996	11 Jul – 19 Aug	Common
1734	<i>Scotopteryx luridata plumbaria</i>	July Belle	1	1983-1987	05 Jul	Common
1737	<i>Epirrhoe tristata</i>	Small Argent and Sable	4	1974-1982	10 Jun – 26 Jul	Common
1738	<i>Epirrhoe alternata</i>	Common Carpet	2000	1968-2005	03 May-08 Oct	Common
1742	<i>Campptogramma bilineata bilineata</i>	Yellow Shell	2	1978-1997	30 Jul – 17 Aug	
1744	<i>Eutephria caesiata</i>	Grey Mountain Moth	5	1968-1994	11 Jun – 29 Sep	Common
1746	<i>Anticlea badiata</i>	Shoulder Stripe	6	1968-2003	15 Apr- 07 May	Common
1747	<i>Anticlea derivata</i>	Streamer	36	1968-2005	26 Apr – 06 Jun	Common
1748	<i>Mesoleuca albicillata</i>	Beautiful Carpet	18	1975-2005	21 Jun – 04 Aug	Common
1750	<i>Lampropteryx suffumata</i>	Water Carpet	1944	1968-2005	02 Mar – 29 Jul	Common
1752	<i>Cosmorhoe ocellata</i>	Purple Bar	3664	1968-2005	11 May –17 Sep	Common
1753	<i>Nebula salicata latentaria</i>	Striped Twin-spot Carpet	2	2004-2005	27 May–23 Aug	Common
1754	<i>Eulithis prunata</i>	Phoenix	2	1978-1984	04 Aug – 02 Sep	Common
1755	<i>Eulithis testata</i>	Chevron	816	1968-2005	28 Jun – 27 Sep	Common
1756	<i>Eulithis populata</i>	Northern Spinach	60399	1968-2005	30 May-06 Nov	Common
1757	<i>Eulithis mellinata</i>	Spinach	1	1975	11 Jun	Common
1758	<i>Eulithis pyraliata</i>	Barred Straw	697	1968-2005	05 Jun – 31 Aug	Common
1759	<i>Ecliptopera silaceata</i>	Small Phoenix	166	1968-2005	09 May-22 Sep	Common
1760	<i>Chloroclysta siterata</i>	Red-green Carpet	897	1968-2005	28 Mar –13 Dec	Common

1761	<i>Chloroclysta miata</i>	Autumn Green Carpet	252	1968-2005	18 Mar-15 Nov	Local
1762	<i>Chloroclysta citrata</i>	Dark Marbled Carpet	5787	1968-2005	28 May-04 Nov	Common
1764	<i>Chloroclysta truncata</i>	Common Marbled Carpet	5870	1968-2005	10 May-05 Nov	Common
1765	<i>Cidaria fulvata</i>	Barred Yellow	5	1968-2005	30 Jun – 10 Aug	Common
1767	<i>Thera firmata</i>	Pine Carpet	5	1982-2002	06 Jul – 24 Sep	Common
1768	<i>Thera obeliscata</i>	Grey Pine Carpet	1494	1968-2005	11 May- 12 Dec	Common
1769	<i>Thera britannica</i>	Spruce Carpet	21	1970-2005	25 May-30 Nov	Common
1771	<i>Thera juniperata</i>	Juniper Carpet	2	1974-2004	18 May-07 Nov	Common
1773	<i>Electrophaes corylata</i>	Broken-barred Carpet	45	1968-2005	24 Apr – 22 Jul	Common
1774	<i>Colostygia olivata</i>	Beech-green Carpet	100	1968-2005	22 Jul – 10 Sep	Local
1775	<i>Colostygia multistrigaria</i>	Mottled Grey	930	1968-2005	30 Jan – 15 May	Common
1776	<i>Colostygia pectinataria</i>	Green Carpet	3086	1968-2005	25 May-27 Oct	Common
1777	<i>Hydriomena furcata</i>	July Highflyer	22167	1968-2005	10 Jun – 02 Nov	Common
1778	<i>Hydriomena impluviata</i>	May Highflyer	71	1968-2001	12 May-24 Aug	Common
1779	<i>Hydriomena ruberata</i>	Ruddy Highflyer	6	1969-1980	27 May – 16 Jul	Local
1789	<i>Rheumaptera undulata</i>	Scallop Shell	1	2004-2005	15 Jul	Common
1795	<i>Epirrita dilutata</i>	November Moth	21874	1968-2005	28 Aug-16 Dec	Common
1795x	<i>Epirrita dilutata</i> agg.	November Moth agg.	2123	1968-2003	04 Sep – 20 Dec	Common
1796	<i>Epirrita christyi</i>	Pale November Moth	613	1976-2005	02 Oct – 08 Dec	Common
1797	<i>Epirrita autumnata</i>	Autumnal Moth	2126	1968-2005	19 Aug-16 Dec	Common
1798	<i>Epirrita filigrammaria</i>	Small Autumnal Moth	44	1969-2000	10 Aug – 19 Sep	Common
1799	<i>Operophtera brumata</i>	Winter Moth	16207	1968-2005	30 Dec - 01 Jan	Common
1800	<i>Operophtera fagata</i>	Northern Winter Moth	1099	1968-2005	23 Dec - 07 Feb	Common
1802	<i>Perizoma affinitata</i>	Rivulet	28	1968-2001	28 May-20 Aug	Common
1803	<i>Perizoma alchemillata</i>	Small Rivulet	213	1968-2005	01 Jun – 23 Aug	Common
1807	<i>Perizoma albulata</i>	Grass Rivulet	4	1971-1976	18 May – 16 Jul	Local
1808	<i>Perizoma flavofasciata</i>	Sandy Carpet	6	1978-2005	12 Jun – 27 Jul	Common
1809	<i>Perizoma didymata didymata</i>	Twin-spot Carpet	8584	1968-2005	06 Jul – 16 Sep	
1811	<i>Eupithecia tenuiata</i>	Slender Pug	3	1986-1996	17 Jul – 10 Aug	Common
1814	<i>Eupithecia plumbeolata</i>	Lead-coloured Pug	2223	1982-2005	13 May- 09 Aug	Nb
1815	<i>Eupithecia abietaria</i>	Cloaked Pug	1	1989	05 Jul	Local (alien-foodplant)
1816	<i>Eupithecia linariata</i>	Toadflax Pug	3	1968	02 Jun – 06 Jul	Common
1817	<i>Eupithecia pulchellata</i>	Foxglove Pug	25	1985-2005	16 May – 30 Jul	Common
1819	<i>Eupithecia exiguata</i>	Mottled Pug	1	1986	06 Jun	Common
1828	<i>Eupithecia satyrata</i>	Satyr Pug	7	1985-2005	08 May – 07 Jul	Common
1830	<i>Eupithecia absinthiata</i>	Wormwood Pug	23	1985-2005	30 Jun – 27 Aug	Common
1832	<i>Eupithecia assimilata</i>	Currant Pug	5	1988-1992	13 Jun – 06 Jul	Common
1834	<i>Eupithecia vulgata</i>	Common Pug	1140	1982-2005	30 Apr – 13 Jul	Common
1835	<i>Eupithecia tripunctaria</i>	White-spotted Pug	1	1987	4 Sep	Local
1837	<i>Eupithecia subfuscata</i>	Grey Pug	113	1985-2005	10 May- 01 Aug	Common
1838	<i>Eupithecia icterata</i>	Tawny-speckled Pug	2	1968-2000	11 Jul – 14 Sep	Common
1846	<i>Eupithecia nanata</i>	Narrow-winged Pug	26	1968-2005	19 May-10 Aug	Common
1849	<i>Eupithecia fraxinata</i>	Ash Pug	3	1995-2005	25 Jul-10 Aug	Common
1851	<i>Eupithecia virgaureata</i>	Golden-rod Pug	120	1986-2005	21 Apr – 14 Sep	Local
1852	<i>Eupithecia abbreviata</i>	Brindled Pug	8820	1971-2005	12 Feb – 05 Jul	Common
1853	<i>Eupithecia dodoneata</i>	Oak-tree Pug	4	1985-2004	07 May-22 May	Common
1854	<i>Eupithecia pusillata</i>	Juniper Pug	141	1985-2005	14 Jul – 06 Oct	Common
1856	<i>Eupithecia lariciata</i>	Larch Pug	38	1985-2001	01 May- 05 Aug	Common
1857	<i>Eupithecia tantillaria</i>	Dwarf Pug	2	1985-1992	17 May – 29 Jun	Common
1858	<i>Chloroclystis v-ata</i>	V-Pug	43	1976-2005	29 Apr – 19 Sep	Common
1860	<i>Pasiphila rectangulata</i>	Green Pug	12	1968-2005	11 Jul- 08 Aug	Common
1861	<i>Pasiphila debiliata</i>	Bilberry Pug	8	2000	23 Jun – 26 Jul	Nb
1862	<i>Gymnoscelis rufifasciata</i>	Double-striped Pug	453	1985-2005	18 Mar -16 Mar	Common
1864	<i>Chesias legatella</i>	Streak	156	1968-2005	13 Sep- 12 Nov	Common
1865	<i>Chesias rufata</i>	Broom-tip	1	1979	01 Jun	Nb
1866	<i>Carsia sororiata anglica</i>	Manchester Treble-bar	2	1968-1987	17 Jul – 17 Aug	Nb
1867	<i>Aplocera plagiata</i>	Treble Bar	6	1968-2005	26 Jul – 07 Sep	Common
1868	<i>Aplocera efformata</i>	Lesser Treble-bar	1	1985	06 Aug	Common
1873	<i>Venusia cambrica</i>	Welsh Wave	206	1968-2005	20 May- 06 Sep	Local

1874	<i>Euchoeca nebulata</i>	Dingy Shell	2	1977-1995	29 Jun – 04 Jul	Local
1875	<i>Asthena albulata</i>	Small White Wave	7	1969-1998	13 Jun – 16 Jul	Common
1876	<i>Hydrelia flammeolaria</i>	Small Yellow Wave	14	1971-2005	06 Jun – 21 Jul	Common
1879	<i>Lobophora halterata</i>	Seraphim	3	1991-2005	15 May- 17 Jun	Local
1881	<i>Trichopteryx carpinata</i>	Early Tooth-striped	568	1968-2005	17 Mar – 04 Jun	Common
1883	<i>Acasis viretata</i>	Yellow-barred Brindle	20	1971-2005	29 Apr – 10 Jun	Local
1887	<i>Lomaspilis marginata</i>	Clouded Border	894	1968-2005	04 May-24 Sep	Common
1889	<i>Macaria notata</i>	Peacock Moth	4	1996-2004	23 May – 09 Jul	Local
1893	<i>Macaria liturata</i>	Tawny-barred Angle	115	1968-2003	21 Ma –15 Aug	Common
1894	<i>Chiasmia clathrata</i>	Latticed Heath	17	1968-2004	19 May-27 Jul	Common
1897	<i>Macaria wauaria</i>	V-Moth	2	1976-1985	08 Jul-05 Aug	Local
1902	<i>Petrophora chlorosata</i>	Brown Silver-line	3258	1968-2005	16 Apr-09 Jul	Common
1903	<i>Plagodis pulveraria</i>	Barred Umber	1329	1968-2005	16 Apr-29 Jun	Local
1904	<i>Plagodis dolabraria</i>	Scorched Wing	1175	1968-2005	02 May-01 Jul	Local
1906	<i>Opisthograptis luteolata</i>	Brimstone Moth	564	1968-2005	12 May-30 Sep	Common
1907	<i>Epione repandaria</i>	Bordered Beauty	5	1972-2005	15 Aug-22Sep	Common
1910	<i>Apeira syringaria</i>	Lilac Beauty	100	1978-2005	08 Jun-17 Sep	Local
1912	<i>Ennomos quercinaria</i>	August Thorn	9	1983-2003	24 Jul-18 Sep	Local
1913	<i>Ennomos alniaria</i>	Canary-shouldered Thorn	800	1968-2005	26 Jul – 22 Oct	Common
1914	<i>Ennomos fuscantaria</i>	Dusky Thorn	26	1975	04 Oct –05 Nov	Common
1915	<i>Ennomos erosaria</i>	September Thorn	223	1968-2005	28 Jul-17 Oct	Common
1917	<i>Selenia dentaria</i>	Early Thorn	939	1968-2005	07 Apr-29 Aug	Common
1918	<i>Selenia lunularia</i>	Lunar Thorn	215	1968-2005	25 Apr-06 Jul	Local
1919	<i>Selenia tetralunaria</i>	Purple Thorn	3	1969-2001	10 May-06 Jul	Common
1920	<i>Odontopera bidentata</i>	Scalloped Hazel	3379	1968-2005	04 May-22 Jul	Common
1921	<i>Crocallis elinguaris</i>	Scalloped Oak	2335	1968-2005	04 Jul-12 Dec	Common
1922	<i>Ourapteryx sambucaria</i>	Swallow-tailed Moth	4	1981-2005	07 Jul-09 Aug	Common
1923	<i>Colotois pennaria</i>	Feathered Thorn	3263	1968-2005	15 Sep-17 Dec	Common
1926	<i>Phigalia pilosaria</i>	Pale Brindled Beauty	1418	1968-2005	01 Jan-30 Dec	Common
1930	<i>Biston strataria</i>	Oak Beauty	1572	1968-2005	13 Feb-24 Apr	Common
1931	<i>Biston betularia</i>	Peppered Moth	120	1968-2004	08 Mar-07 Aug	Common
1931	<i>Biston betularia f. insularia</i>	Peppered Moth [melanic form]	2	1985-1998	23 May-14 Jul	Common
1932	<i>Agriopsis leucophaearia</i>	Spring Usher	2395	1968-2005	30 Dec-01 Jan	Common
1933	<i>Agriopsis aurantiaria</i>	Scarce Umber	1721	1968-2005	22 Dec-13 Jan	Common
1934	<i>Agriopsis marginaria</i>	Dotted Border	351	1968-2005	19 Jan-19 Apr	Common
1935	<i>Erannis defoliaria</i>	Mottled Umber	31717	1968-2005	30 Dec-01 Jan	Common
1937	<i>Peribatodes rhomboidaria</i>	Willow Beauty	8	1983-1989	03 Jul-14 Jul	Common
1940	<i>Deileptenia ribeata</i>	Satin Beauty	789	1980-2005	22 Jun-15 Sep	Common
1941	<i>Alcis repandata</i>	Mottled Beauty	7056	1968-2005	09 Jun-11 Sep	Common
1942	<i>Alcis jubata</i>	Dotted Carpet	8450	1968-2005	24 Jun-14 Sep	Local
1947	<i>Ectropis bistortata</i>	Engrailed	625	1968-2005	17 Feb-22 Aug	Common
1951	<i>Aethalura punctulata</i>	Grey Birch	15	1998-2005	15 Apr-26 May	Common
1954	<i>Bupalus piniaria</i>	Bordered White	2	1983-2002	01 Jun-07 Jun	Common
1955	<i>Cabera pusaria</i>	Common White Wave	3441	1968-2005	11 May-06 Sep	Common
1956	<i>Cabera exanthemata</i>	Common Wave	391	1968-2005	20 May-12 Aug	Common
1958	<i>Lomographa temerata</i>	Clouded Silver	214	1970-2005	27 Apr-09 Jul	Common
1960	<i>Theria prinaria</i>	Early Moth	11	1977-2002	07 Jan-24 Mar	Common
1961	<i>Campaea margaritata</i>	Light Emerald	3423	1968-2005	10 Jun-12 Oct	Common
1962	<i>Hylaea fasciaria</i>	Barred Red	108	1968-2005	05 Jun-07 Sep	Common
1970	<i>Perconia strigillaria</i>	Grass Wave	5	1984	09 May-20 May	Local
1981	<i>Laothoe populi</i>	Poplar Hawk-moth	51	1968-2005	16 May-22 Jul	Common
1991	<i>Deilephila elpenor</i>	Elephant Hawk-moth	2	1984-1995	22 Jun-28 Jun	Common
1994	<i>Phalera bucephala</i>	Buff-tip	150	1968-2005	28 May- 06 Aug	Common
1997	<i>Furcula furcula</i>	Sallow Kitten	2	1991-2005	31 May-8 th Jul	Common
2000	<i>Notodonta dromedarius</i>	Iron Prominent	21	1968-2005	29 Apr-17 Aug	Common
2003	<i>Notodonta ziczac</i>	Pebble Prominent	13	1970-2005	10 May-06 Aug	Common
2005	<i>Peridea anceps</i>	Great Prominent	626	1968-2005	17 Apr-01 Jul	Local
2006	<i>Pheosia gnoma</i>	Lesser Swallow Prominent	252	1968-2005	01 May-05 Sep	Common
2007	<i>Pheosia tremula</i>	Swallow Prominent	5	1969-2005	21 May-21 Jul	Common
2008	<i>Ptilodon capucina</i>	Coxcomb Prominent	268	1968-2005	16 May- 26 Aug	Common

2010	<i>Odontosia carmelita</i>	Scarce Prominent	75	1968-2005	03 Apr-21 May	Local
2011	<i>Pterostoma palpina</i>	Pale Prominent	1	1995	17 Aug	Common
2014	<i>Drymonia dodonaea</i>	Marbled Brown	536	1968-2005	24 Apr-14 Jul	Local
2015	<i>Drymonia ruficornis</i>	Lunar Marbled Brown	153	1968-2005	10 Mar-28 Jun	Common
2026	<i>Orgyia antiqua</i>	Vapourer	12	1972-2005	19 Jul-17 Oct	Common
2038	<i>Nudaria mundana</i>	Muslin Footman	4	1976-2005	18 Jun-11 Jul	Local
2039	<i>Atolmis rubricollis</i>	Red-necked Footman	1	1999	11 Jun	Local
2040	<i>Cybosia mesomella</i>	Four-dotted Footman	221	1968-2005	02 Jun-21 Jul	Local
2050	<i>Eilema lurideola</i>	Common Footman	3	1982-1983	04 Jun-14 Jul	Common
2057	<i>Arctia caja</i>	Golden Tiger	4	1984-2004	02 Jul-14 Aug	Common
2059	<i>Diacrisia sannio</i>	Clouded Buff	12	1968-2001	01 Jun-24 Aug	Local
2060	<i>Spilosoma lubricipeda</i>	White Ermine	301	1968-2005	11 May-07 Aug	Common
2064	<i>Phragmatobia fuliginosa</i>	Ruby Tiger	1	1976	23 May	Common
2069	<i>Tyria jacobaeae</i>	Cinnabar	1	1969	06 Jun	Common
2077	<i>Nola cucullatella</i>	Short-cloaked Moth	3	1971-1986	01 Jun-30 Jun	Common
2078	<i>Nola confusalis</i>	Least Black Arches	2232	1968-2005	01 Apr-01 Aug	Local
2081	<i>Euxoa tritici</i>	White-line Dart	3	1971-1972	26 Aug-17 Sep	Common
2089	<i>Agrotis exclamatonis</i>	Heart and Dart	1	1985	12 Jul	Common
2091	<i>Agrotis ipsilon</i>	Dark Sword-grass	3	1973-1995	03 Oct-03 Dec	Migrant
2102	<i>Ochropleura plecta</i>	Flame Shoulder	485	1968-2005	11 May-08 Sep	Common
2107	<i>Noctua pronuba</i>	Large Yellow	126	1968-2005	18 Feb-08 Sep	Common
2109	<i>Noctua comes</i>	Underwing Lesser Yellow	32	1968-2005	07 Jul-19 Sep	Common
2110	<i>Noctua fimbriata</i>	Underwing Broad-bordered	18	1968-2005	25 Jul-17 Sep	Common
2111	<i>Noctua janthe</i>	Yellow Underwing Lesser Broad-bordered	21	1969-2005	21 Jul-07 Sep	Common
2114	<i>Graphiphora augur</i>	Yellow Underwing				
2117	<i>Eugnorisma glareosa</i>	Double Dart	27	1968-2000	20 Jun-09 Aug	Common
2118	<i>Lycophotia porphyrea</i>	Autumnal Rustic	78	1968-2005	19 Aug-30 Sep	Common
2120	<i>Diarsia mendica mendica</i>	True Lover's Knot	2031	1968-2005	25 May-02 Sep	Common
2121	<i>Diarsia dahlii</i>	Ingrailed Clay	8808	1968-2005	04 Jun-19 Sep	
2122	<i>Diarsia brunnea</i>	Barred Chestnut	3082	1968-2005	16 Jul-26 Sep	Local
2123	<i>Diarsia rubi</i>	Purple Clay	1923	1968-2005	08 Jun-06 Sep	Common
2126	<i>Xestia c-nigrum</i>	Small Square-spot	123	1968-2005	08 Jun-07 Sep	Common
2127	<i>Xestia ditrapezium</i>	Setaceous Hebrew	1	1971	29 Jul	Common
2128	<i>Xestia triangulum</i>	Character				
2130	<i>Xestia baja</i>	Triple-spotted Clay	5	1987-2005	02 Jul-02 Aug	Local
2132	<i>Xestia castanea</i>	Double Square-spot	28	1968-2000	25 Jun-26 Aug	Common
2133	<i>Xestia sexstrigata</i>	Dotted Clay	452	1968-2005	02 Jul-01 Sep	Common
2134	<i>Xestia xanthographa</i>	Neglected Rustic	71	1968-2003	05 Aug-25 Sep	Local
2135	<i>Xestia agathina</i>	Six-striped Rustic	7	1971-1982	01 Aug-27 Aug	Common
2136	<i>Naenia typica</i>	Square-spot Rustic	161	1968-2005	10 Jul-24 Sep	Common
2137	<i>Eurois occulta</i>	Heath Rustic	1	1998	19 Aug	Local
2138	<i>Anaplectoides prasina</i>	Gothic	4	1983-2004	17 Jul-12 Aug	Local
2139	<i>Cerastis rubricosa</i>	Great Brocade	10	1976-2004	01 Jul-17 Aug	Na
2147	<i>Hada plebeja</i>	Green Arches	286	1968-2005	11 Jun-15 Aug	Common
2149	<i>Polia trimaculosa</i>	Red Chestnut	342	1968-2005	10 Mar-23 May	Common
2150	<i>Polia nebulosa</i>	Shears	1	1977	21 Jun	Common
2154	<i>Mamestra brassicae</i>	Silvery Arches	5	1976-1982	24 Jun-04 Jul	Nb
2158	<i>Lacanobia thalassina</i>	Grey Arches	115	1968-2005	08 Jun-03 Aug	Common
2160	<i>Lacanobia oleracea</i>	Cabbage Moth	1	1976	23 Jun	Common
2162	<i>Papestra biren</i>	Pale-shouldered	211	1968-2004	10 May-18 Jul	Common
2163	<i>Melanchra pisi</i>	Brocade				
2166	<i>Hadena rivularis</i>	Bright-line Brown-eye	3	1976-2000	20 Jun-16 Jul	Common
2173	<i>Hadena bicurris</i>	Glaucous Shears	14	1968-2000	05 May-22 Sep	Local
2176	<i>Cerapteryx graminis</i>	Broom Moth	22	1968-2005	15 May-08 Aug	Common
2179	<i>Panolis flammea</i>	Campion	1	1971-1997	29 May-16 Jul	Common
2182	<i>Orthosia cruda</i>	Lychnis	1	1987	17 Jul	Common
2184	<i>Orthosia opima</i>	Antler	510	1968-2005	12 Jul-13 Sep	Common
		Pine Beauty	1	1976-2004	05 May-09 May	Common
		Small Quaker	3713	1968-2005	07 Mar-20 May	Common
		Northern Drab	1	1975	13 Apr	Local

2186	<i>Orthosia gracilis</i>	Powdered Quaker	72	1970-2003	03 Apr-17 May	Common
2187	<i>Orthosia cerasi</i>	Common Quaker	2583	1968-2005	15 Mar-31 May	Common
2188	<i>Orthosia incerta</i>	Clouded Drab	190	1968-2005	17 Mar-19 May	Common
2189	<i>Orthosia munda</i>	Twin-spotted Quaker	403	1970-2005	20 Mar-24 May	Common
2190	<i>Orthosia gothica</i>	Hebrew Character	2627	1968-2005	07 Feb-07 Jun	Common
2193	<i>Mythimna ferrago</i>	Clay	6	1971-1983	23 Jul-18 Aug	Common
2198	<i>Mythimna impura</i>	Smoky Wainscot	168	1968-2005	25 Jun-23 Aug	Common
2199	<i>Mythimna pallens</i>	Common Wainscot	1	1968-1986	08 Jul-31 Aug	Common
2225	<i>Brachylomia viminalis</i>	Minor Shoulder-knot	145	1968-2005	08 Jul-07 Sep	Common
2231a	<i>Aporophyla lueneburgensis</i>	Northern Deep-brown Dart	1	1977	20 Jul	Common
2232	<i>Aporophyla nigra</i>	Black Rustic	8	1971-2001	27 Jul-07 Oct	Common
2233	<i>Lithomoia solidaginis</i>	Golden-rod Brindle	4	1969-1982	25 Aug-07 Sep	Local
2241	<i>Xylena vetusta</i>	Red Sword-grass	14	1973-2000	03 Dec-07 Feb	Local
2243	<i>Xylocampa areola</i>	Early Grey	120	1968-2005	23 Feb-20 May	Common
2245	<i>Allophyes oxyacanthae</i>	Green-brindled Crescent	536	1968-2005	07 Sep-28 Oct	Common
2245	<i>Allophyes oxyacanthae ab. capucina</i>	Green-brindled Crescent [ab. capucina]	1	1987	Oct	Common
2247	<i>Dichonia aprilina</i>	Merveille du Jour	126	1968-2005	18 Sep-02 Dec	Common
2248	<i>Dryobotodes eremita</i>	Brindled Green	230	1968-2005	13 Aug-10 Oct	Common
2250	<i>Blepharita adusta</i>	Dark Brocade	4	1968-2005	23 May-05 Jul	Common
2254	<i>Antitype chi</i>	Grey Chi	2	1986-1988	02 Sep-19 Sep	Common
2256	<i>Eupsilia transversa</i>	Satellite	120	1968-2005	17 Dec-20 Feb	Common
2258	<i>Conistra vaccinii</i>	Chestnut	4605	1968-2005	30 Dec-01 Jan	Common
2259	<i>Conistra ligula</i>	Dark Chestnut	11	1984-2005	20 Sep-10 Nov	Common
2262	<i>Agrochola circellaris</i>	Brick	8	1971-2000	08 Sep-11 Oct	Common
2263	<i>Agrochola lota</i>	Red-line Quaker	32	1968-2004	12 Sep-19 Oct	Common
2264	<i>Agrochola macilenta</i>	Yellow-line Quaker	409	1968-2005	06 Sep-02 Dec	Common
2265	<i>Agrochola helvola</i>	Flounced Chestnut	68	1968-2002	27 Aug-06 Oct	Common
2266	<i>Agrochola litura</i>	Brown-spot Pinion	1	1975	03 Sep	Common
2268	<i>Parastichtis suspecta</i>	Suspected	1	2005	12 Aug	Local
2270	<i>Omphaloscelis lunosa</i>	Lunar Underwing	2	1975	16 Sep-17 Sep	Common
2271	<i>Xanthia citrigo</i>	Orange Sallow	1	2000	05 Sep	Common
2273	<i>Xanthia togata</i>	Pink-barred Sallow	109	1968-2005	17 Aug-30 Sep	Common
2274	<i>Xanthia icteritia</i>	Sallow	26	1968-2004	15 Aug-03 Oct	Common
2284	<i>Acronicta psi</i>	Grey Dagger	2	1970-1985	03 Jun-15 Jul	Common
2286	<i>Acronicta menyanthidis</i>	Light Knot Grass	2	1977	23 Jun-30 Jun	Local
2289	<i>Acronicta rumicis</i>	Knot Grass	43	1968-2005	15 May-01 Aug	Common
2293	<i>Cryphia domestica</i>	Marbled Beauty	1	1978	10 May	Common
2299	<i>Amphipyra tragopoginis</i>	Mouse Moth	10	1975-1983	11 Aug-08 Sep	Common
2300	<i>Mormo maura</i>	Old Lady	1	2005	10 Aug	Local
2302	<i>Rusina ferruginea</i>	Brown Rustic	2387	1968-2005	30 May-11 Jul	Common
2305	<i>Euplexia lucipara</i>	Small Angle Shades	78	1968-2005	20 May-11 Aug	Common
2306	<i>Phlogophora meticulosa</i>	Angle Shades	4	1973-2002	20 Jul-03 Dec	Common
2318	<i>Cosmia trapezina</i>	Dun-bar	1250	1968-2005	16 Jul-06 Oct	Common
2320	<i>Hyppa rectilinea</i>	Saxon	26	1976-2005	19 May-10 Jul	Nb
2321	<i>Apamea monoglypha</i>	Dark Arches	256	1968-2005	22 Jun-02 Oct	Common
2322	<i>Apamea lithoxylaea</i>	Light Arches	2	1970-1975	23 Jun-01 Sep	Common
2326	<i>Apamea crenata</i>	Clouded-bordered Brindle	31	1968-2005	22 May-08 Aug	Common
2330	<i>Apamea remissa</i>	Dusky Brocade	3	1968-2004	06 Jun-16 Jul	Common
2335	<i>Apamea scolopacina</i>	Slender Brindle	1	2005	29 Jul	Local
2336	<i>Apamea ophiogramma</i>	Double Lobed	1	2003	08 Aug	Local
2337	<i>Oligia strigilis</i>	Marbled Minor	294	1968-2001	21 Jun-03 Sep	Common
2337x	<i>Oligia strigilis agg.</i>	Marbled Minor agg.	35	1987-2003	19 Jun-19 Aug	
2338	<i>Oligia versicolor</i>	Rufous Minor	53	1987-2005	07 Jul-19 Aug	Local
2339	<i>Oligia latruncula</i>	Tawny Marbled Minor	13	1978-2003	30 Jun-28 Jul	Common
2340	<i>Oligia fasciuncula</i>	Middle-barred Minor	7	1968-2005	22 Jun-06 Aug	Common
2341	<i>Mesoligia furuncula</i>	Cloaked Minor	5	1968-1969	24 Aug-02 Sep	Common
2342	<i>Mesoligia literosa</i>	Rosy Minor	13	1975-1986	29 Jul-09 Sep	Common
2343	<i>Mesapamea secalis</i>	Common Rustic	36	1968-2005	30 Jun-24 Sep	Common
2345	<i>Photedes minina</i>	Small Dotted Buff	149	1968-2005	11 Jun-12 Aug	Common

2350	<i>Chortodes pygmina</i>	Small Wainscot	884	1968-2005	24 Jul-12 Oct	Common
2353	<i>Luperina testacea</i>	Flounced Rustic	1	1984	22 Aug	Common
2357	<i>Amphipoea lucens</i>	Large Ear	367	1971-2005	25 Jul-11 Oct	Local
2358	<i>Amphipoea fucosa paludis</i>	Saltern Ear	2	2004-2005	12 Aug-05 Sep	Local
2360	<i>Amphipoea oculea</i>	Ear Moth	38	1969-1989	04 Aug-30 Sep	Common
2360x	<i>Amphipoea oculea</i> agg.	Ear Moth agg.	25	1968-2004	05 Aug-26 Sep	
2361	<i>Hydraecia micacea</i>	Rosy Rustic	97	1968-2005	02 Aug-12 Oct	Common
2362	<i>Hydraecia petasitis</i>	Butterbur	1	2000	30 Aug	Local
2367	<i>Celaena haworthii</i>	Haworth's Minor	81	1968-2004	18 Jul-24 Sep	Local
2368	<i>Celaena leucostigma</i>	Crescent	36	1968-2004	03 Aug-19 Sep	Local
2375	<i>Rhizedra lutosa</i>	Large Wainscot	1	1982	13 Sep	Common
2379	<i>Coenobia rufa</i>	Small Rufous	1	1968	06 Sep	Local
2381	<i>Hoplodrina alsines</i>	Uncertain	1	1979	02 Aug	Common
2382	<i>Hoplodrina blanda</i>	Rustic	5	1970	03 Aug-14 Aug	Common
2387	<i>Caradrina morpheus</i>	Mottled Rustic	26	1970-1980	22 Jul-08 Sep	Common
2394	<i>Stilbia anomala</i>	Anomalous	140	1968-2004	25 Jun-01 Nov	Local
2407	<i>Eublemma ostrina</i>	Purple Marbled	2	1968	19 Jan	Migrant
2412	<i>Deltote uncula</i>	Silver Hook	2	1979-1983	05 Jul-12 Jul	Local
2422	<i>Pseudoips prasinana</i>	Green Silver-lines	1	2005	06 Jun	Common
2423	<i>Nycteola revayana</i>	Oak Nycteoline	4	1978-2004	10 Oct-06 Jan	Local
2425	<i>Colocasia coryli</i>	Nut-tree Tussock	1541	1968-2005	24 Apr-09 Oct	Common
2434	<i>Diachrysis chrysitis</i>	Burnished Brass	7	1968-2005	04 Jul-12 Aug	Common
2439	<i>Plusia festucae</i>	Gold Spot	2	1969-2001	14 Jul-02 Aug	Common
2441	<i>Autographa gamma</i>	Silver Y	15	1969-2000	19 May-23 Oct	Migrant
2442	<i>Autographa pulchrina</i>	Beautiful Golden Y	121	1968-2005	07 Jun-17 Aug	Common
2443	<i>Autographa jota</i>	Plain Golden Y	4	1969-2004	19 Jul-01 Aug	Common
2444	<i>Autographa bractea</i>	Gold Spangle	3	1969-2005	23 Jul-21 Aug	Common
2447	<i>Syngrapha interrogationis</i>	Scarce Silver Y	2	1971-2000	13 Jul-30 Jul	Local
2449	<i>Abrostola triplasia</i>	Dark Spectacle	1	2005	08 Jul	Common
2450	<i>Abrostola tripartita</i>	Spectacle	7	1968-2002	25 May-13 Jul	Common
2469	<i>Scoliopteryx libatrix</i>	Herald	7	1969-2000	10 Sep-19 Apr	Common
2474	<i>Rivula sericealis</i>	Straw Dot	299	1968-2005	25 Jun-16 Sep	Common
2477	<i>Hypena proboscidalis</i>	Snout	127	1968-2005	27 Jun-07 Sep	Common
2484	<i>Schrankia costaestrigalis</i>	Pinion-streaked Snout	47	1989-2005	24 Jun-25 Sep	Local
2485	<i>Hypenodes humidalis</i>	Marsh Oblique-barred	12	2001-2005	14 Jul-09 Aug	Nb
2489	<i>Zanclognatha tarsipennalis</i>	Fan-foot	6	2000-2005	05 Jul-09 Aug	Common
2492	<i>Herminia grisealis</i>	Small Fan-foot	246	1968-2005	29 May-12 Aug	Common

DISCUSSION

Reliability of the data-set

In a data set of 344,361 moths, it must be expected that there will be some misidentification. The data-set has therefore been scanned for records of species outside their accepted range, with no other records from Stirlingshire, West Perthshire and Dunbartonshire (vice counties 86,87 and 99) and with no regular pattern of occurrence. On the basis of this analysis, and with the agreement of RIS, the small number of records of twelve species, largely from the early years of the survey, have been deleted from the data-set and are not included in Table 1. They include Mullein Wave (*Scopula marginepunctata*), Dwarf Cream Wave (*Idea fuscovenosa*), Small Dusty Wave (*Idea seriata*) and Single Dotted Wave (*Idaea dimidiata*) all of which were probably confused with the various colour morphs of Small Fan-footed Wave (*Idaea biselata*). Also deleted was a 1969 record of Wood Carpet (*Epirrhoe rivata*) considered likely to be a misidentification of Common Carpet (*Epirrhoe alternata*) although there is a recent validated record from Glen Douglas, five records in 1969 of Barred Carpet (*Perizoma taeniata*), three 1979 records of Cousin German (*Protolampra sobrina*) likely to have been a misidentification of Barred Chestnut (*Diarsia dahlia*) and a single record of Dot Moth (*Melanchnra persicariae*) which in view of the date of the single record was likely to be an incorrect entry for Cabbage Moth (*Mamestra brassicae*). Similarly, records of Devon Carpet (*Lampropteryx otregiata*) have been reassessed as a probable mistaken identification of Water Carpet (*Lampropteryx suffumata*) and records of Marbled Pug (*Eupithecia irriguata*), Treble Lines (*Charanyca trigrammica*) and Maple Prominent (*Ptilodon cucullina*) have been deleted because these species are extremely unlikely in the area.

A number of other records have not been removed from the data-set because, although the species would be unexpected in a Loch Lomondside oak wood, misidentification by expert recorders is considered unlikely. Nevertheless, the following species require confirmation, ideally with voucher specimens, before their presence on Loch Lomondside is accepted

- Small White Wave (*Asthena albulata*) – six records in 1969 and one in 1998
- Oak Tree Pug (*Eupithecia dodoneata*) – records in 1981, 1985 and 2004 and identified by an expert on the group. However, the species is not otherwise recorded north of Durham
- Bilberry Pug (*Pasiphila debilata*) – recorded in 2000, 2001, 2003 and 2005 and identified by an expert on the group. It is well away from known sites for the species but bilberry (*vaccinium myrtillus*) is a dominant under-story plant at Rowardennan and it appears likely that the species has moved into the area.

- Cinnabar (*Tyria jacobaeae*) – one 1969 record assumed to be a wanderer
- Short Cloaked (*Nola cucullatella*) – one record in 1971 and two in 1986
- White-lined Dart (*Euxoa tritici*) – records from 1971 and 1972
- Northern Drab (*Orthosia opima*) – one record in 1975
- Cloaked Minor (*Mesoligia furuncula*) – records in 1968 and 1969
- Butterbur (*Hydraecia petasitis*) – this species is not known with certainty in west-central Scotland, is very easily confused with the dark form of Rosy Rustic (*Hydraecia micacea*) which occurs in the area and Butterbur is normally only recorded at or very near its foodplant. Nevertheless the single record in 2000 was identified by an expert.

A small number of British macro-Moths are almost impossible to identify with certainty without examination of their genitalia. These include the November Moth, Pale November Moth, Autumnal Moth and Small Autumnal Moth (*Epirrita spp*), the ear moths (*Amphipoea sp.*), the Marbled Minor/Tawny Marbled Minor/Rufous Minor group (*Oligia spp*) and the Grey and Dark Dagger (*Acronicta spp*). In all of these cases, identification by RIS is based on examination of the genitalia. However, they do not differentiate between Common Rustic (*Mesapamea secalis*) and Lesser Common Rustic (*Mesapamea didyma*) so all records refer to an aggregate of these two species.

The fact that such a detailed examination has been conducted provides a window on the relative abundance of closely related species that are seldom identified with certainty in large numbers. Thus, the data-base records 21874 November Moths, 613 Pale November Moths, 2126 Autumnal Moths and 44 Small Autumnal Moths showing that in the Rowardennan oak-wood these species occur in a ratio of 497:14:48:1. Similarly, 183 Large Ear Moths and 19 Ear Moths are caught for every Saltern Ear and Marbled Minor/Tawny Marbled Minor/Rufous Minor are recorded in the ratio 23:4:1.

Changes in the abundance and diversity in the moth assemblage

An initial analysis of the data-set has demonstrated that between 1968 and 2003 both the number of individuals caught and the species diversity of the Loch Lomondside moth assemblage has increased (Salama *et al.*, 2005, 2007). Further analysis of these changes are outside the scope of this paper but Table 1 illustrates the year that each species was first recorded and whether further records followed. It thus provides an indication of the increasing diversity of the catch. The most striking recent changes are captures of Red-necked Footman (*Atolmis rubricolis*) and Slender Brindle (*Apamea scolopacina*), two species known to

be rapidly spreading northwards (Knowler and Mitchell,2004; Knowler 2005)

National Status of the Moths of Loch Lomondside

Every species of moth recorded in the UK has been allocated a national status by the Joint Nature Conservation Committee. For resident species these are:

- Red Data Book species (RDB) - for species known from 15 or less 10km squares in the UK,
- Nationally Scarce A (Na) - for species recorded from 16-30 10km squares since January 1980
- Nationally Scarce B (Nb) - for species recorded from 30-100 10km squares since January 1980
- Local - for species recorded from 100-300 10km squares since January 1980
- Common - for species recorded from over 300 10km squares since January 1980
- Uncommon on introduced food-plant
- Immigrant
- Rare immigrant
- Import.

The right-hand column of table 1 shows the UK National status of each of the recorded moth species. It will be noticed that the list includes a single Nationally Scarce A moth, the Great Brocade (*Eurois occulta*), which was recorded in 1976, 1981, 1991, 1998 and 2004. This classification is probably misleading as the resident form of the species is nationally scarce but it also occurs as a migrant. The migrant form of *E. occulta* can usually be identified by their much paler colouration. The resident form breeds on Bog Myrtle (*Myrica gale*) on raised bogs a habitat not present near the site. The colour form of the recorded moths was not identified but the sporadic nature of the records indicates that they were migrants.

Seven Nationally Scarce B moths are recorded at Rowardennan : Lead-coloured Pug (*Eupithecia plumbeolata*), Bilberry Pug (*Pasiphila debiliata*), Broom Tip (*Chesias rufata*), Manchester Treble-bar (*Carsia sororiata anglica*), Silvery Arches (*Polia hepatica*), the Saxon (*Hyppa rectilinear*) and Marsh Oblique-barred (*Hypenodes humidalis*). The list also includes 55 nationally local moth species.

In assessing the importance of the Loch Lomondside moth assemblage, it is important to understand that because a moth is common in the UK as a whole does not mean that it is common in the west of Scotland or even in northern Britain. Thus, some species, for example Small Yellow Wave (*Hydrelia flammeolaria*) and Lilac Beauty (*Aperia syringaria*), which are classified as common and are regularly recorded at Rowardennan, are nevertheless at or close to the northern limit of their range.

The completeness of the record at Rowardennan

This analysis of moths at Rowardennan rests entirely on those species that are attracted to light. It follows that those species not attracted to light are not included and some of these are common. Thus day flying moths such as Speckled Yellow (*Psuedopanthera macularia*), Chimney Sweeper (*Odezia atrata*) and members of the Sesiidae (Clearwings) are missing from the list. One of the latter, the Welsh Clearwing (*Synanthedon scoliaeformis*) is a Red Data Book species that has recently been discovered in the Trossachs and may well occur on Loch Lomondside (Knowler,2007). The absence of other moths from the list is rather more surprising. For instance The Pretty Pinion (*Perizoma blandiata*) is a moth with a northern distribution. One of us (J.T.K.) has caught it at several locations in the area including Balmaha on the southern edge of the Loch Lomond oak woods but it has apparently never been recorded at Rowardennan. Similarly, the Blue-bordered Carpet (*Plemyria rubiginata*) would be expected flying around the loch-side alders at dusk. It is only weakly attracted to light but it is nevertheless surprising that it has not been recorded in 37 years.

Conversely, a significant number of the moths that have been recorded at Rowardennan are unexpected because in a closed oak woodland they are well away from their normal habitat. Notable in this respect are species of open moorland and raised bogs which include Manchester Treble-bar (*Carsia sororiata anglica*), Four-dotted Footman (*Cybosia mesomella*), Silver Arches (*Polia trimaculosa*), Heath Rustic (*Xestia agathina*), Glaucous Shears (*Papestra biren*), Golden-rod Brindle (*Lithomoia solidaginis*), Haworth's Minor (*Celaena haworthii*), Anomalous (*Stilbia anomala*) and Crescent (*Celaenia leucostigma*). That these species have been recorded, albeit in small numbers, is a testament to the mobility of many moth species. At least some of the species with a query against their record may well represent extreme examples of this mobility. For instance, if it is assumed that the single Cinnabar Moth (*Tyria jacobaeae*) record is genuine, then the nearest known colonies to Loch Lomondside are in Ayrshire and Lothians; a considerable distance for an insect that does not impress with the apparent strength of its flight.

Another caution that must be expressed when presenting a checklist of moths on the basis of those attracted to light is that some species are much more strongly attracted to light than others and this will affect any quantitative comparison. For instance the data includes 5170 records of December Moth (*Poecilocampa populi*) and 16,207 records of Winter Moth (*Operophtera brumata*). This could lead to the supposition that December Moth is a third as common as Winter Moth when it is in fact very much less common. A combination of all of the above variables will influence the relative abundance of the 320 species caught at Rowardennan. Thus the most commonly recorded species are those that would be expected in oak woods. Less commonly and rarely recorded species range from those that occur in habitats that are

distant from the trap site; those species that have recently moved into the area; species that are poorly attracted to light and those species that are naturally uncommon.

Moth Flight Times

In Table 1, the column showing the first recorded and the last recorded capture date frame the flight times of the commonly caught moths. It should be realised however that flight time records will follow a Poisson distribution. Thus, the period when the species is most abundant may be significantly shorter than the time period indicated by the first and last recorded dates. Furthermore, the first and last dates misrepresent the flight times of the small number of species with two broods a year. Thus the Grey Pine Carpet (*Thera obeliscata*) does not fly continuously from 11th May to the 12th December but the two broods are typically on the wing from May to July and from September to late November. Some species that are double or even triple brooded in Southern England are only partially double brooded on Loch Lomondside. Thus, there is a main emergence period and a second one with small numbers on the wing sometimes only in favourable years.

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REFERENCES

- Bradley, J.D. (2000). Checklist of Lepidoptera recorded from the British Isles. Fordingbridge.
- Conrad, K.F., Woiwod, I.P., Parsons, M., Fox, R. & Warren, M.S. (2004) Long-term population trends in widespread British moths, *Journal of Insect Conservation* 8, 119-136.
- Knowler, J.T. (2005). The Slender Brindle in West Central Scotland. *Glasgow Naturalist*, 24, 64.
- Knowler, J.T. & Mitchell, J. (2004). The Red-necked Footman in West-Central Scotland. *Glasgow Naturalist* 24, 142-143.
- Knowler, J.T. (2008). The Welsh clearwing in The Trossachs. *Glasgow Naturalist* 25, 89-90.
- Salama, N., Knowler, J.T. & Adams, C.E. (2005). Long-term change in the moth assemblage of east Loch Lomondside:1968-2003. *Glasgow Naturalist* 24, 13.
- Salama, N., Knowler, J.T. & Adams C.E.(2007) Increasing abundance and diversity in the moth assemblage of east Loch Lomondside, Scotland over a 35 year period. *Journal of Insect Conservation* 11, 151-156.